

CLAIMS

- 1 1. An inductive energy harvester that generates electrical energy from mechanical
2 vibrations, the energy harvester comprising:
 - 3 a magnetic field source having a first pole and a second pole that
4 generate a magnetic field;
 - 5 an induction coil;
 - 6 an induction coil support that positions the induction coil near the first
7 magnetic field source pole; and
 - 8 a mechanical connector that mechanically couples the magnetic field
9 source to the induction coil support in a manner that allows relative movement
10 between the magnetic field source and the induction coil in response to the
11 vibrations.
- 1 2. The inductive energy harvester of claim 1 further comprising:
 - 2 a flux concentrator attached to the first pole in order to concentrate the
3 magnetic field emerging from the first pole in the vicinity of the induction coil.
- 1 3. The inductive energy harvester of claim 1 wherein the mechanical connector
2 comprises a spiral disk spring.
- 1 4. The inductive energy harvester of claim 1 wherein the mechanical connector
2 comprises a pair of spiral disk springs.
- 1 5. The inductive energy harvester of claim 1 wherein the mechanical connector
2 comprises at least one leaf spring.
- 1 6. The inductive energy harvester of claim 1 wherein the mechanical connector
2 comprises at least one coil spring.

- 1 7. The inductive energy harvester of claim 1 further comprising a flux yoke attached
- 2 to the second magnetic field source pole to provide a low reluctance flux path
- 3 between the first and second magnetic field source poles.

- 1 8. The inductive energy harvester of claim 7 wherein the flux yoke surrounds the
- 2 magnetic field source.

- 1 9. The inductive energy harvester of claim 7 wherein the mechanical connector
- 2 attaches to the flux yoke.

- 1 10. The inductive energy harvester of claim 9 further comprising a non-magnetic
- 2 housing and wherein the mechanical connector attaches to the housing.

- 1 11. The inductive energy harvester of claim 7 wherein the flux yoke is a magnet
- 2 having a polarization that enhances magnetic flux in the vicinity of the induction
- 3 coil.

- 1 12. The inductive energy harvester of claim 11 wherein the flux yoke comprises an
- 2 annular permanent magnet.

- 1 13. The inductive energy harvester of claim 1 wherein the induction coil surrounds
- 2 one pole of the magnetic field source.

- 1 14. The inductive energy harvester of claim 1 wherein the magnetic field source is a
- 2 permanent magnet.

- 1 15. The inductive energy harvester of claim 1 further comprising a second magnetic
- 2 field source arranged in magnetic flux opposition to the magnetic field source.
- 1 16. The inductive energy harvester of claim 15 further comprising a magnetic flux
- 2 concentrator positioned between the magnetic field source and the second
- 3 magnetic field source and in the vicinity of the induction coil.
- 1 17. An inductive energy harvester that generates electrical energy from mechanical
- 2 vibrations, the energy harvester comprising:
 - 3 a permanent magnet having a first pole and a second pole that generates
 - 4 a magnetic field;
 - 5 a flux concentrator attached to the first pole;
 - 6 an induction coil surrounding the flux concentrator;
 - 7 a spring that mechanically couples the permanent magnet to the induction
 - 8 coil in a manner that allows relative movement between the permanent magnet
 - 9 and the induction coil in response to the vibrations.
- 1 18. The inductive energy harvester of claim 17 wherein the flux concentrator is
- 2 comprised of a high magnetic permeability material.
- 1 19. The inductive energy harvester of claim 17 further comprising a magnetically
- 2 permeable flux yoke extending from the second pole to the first pole.
- 1 20. The inductive energy harvester of claim 19 wherein the flux yoke is an annular
- 2 permanent magnet with a polarization that enhances magnetic flux in the vicinity
- 3 of the induction coil.
- 1 21. The inductive energy harvester of claim 19 wherein the flux yoke surrounds the
- 2 permanent magnet.

- 1 22. The inductive energy harvester of claim 19 further comprising a non-magnetic
- 2 housing and wherein the spring attaches the housing to the flux yoke.
- 1 23. The inductive energy harvester of claim 22 further comprising a second spring
- 2 attached between the flux yoke and the housing.
- 1 24. The inductive energy harvester of claim 17 wherein the spring is a spiral disk
- 2 spring.
- 1 25. The inductive energy harvester of claim 17 wherein the spring is a leaf spring.
- 1 26. The inductive energy harvester of claim 17 wherein the spring is a coil spring.
- 1 27. An inductive energy harvester that generates electrical energy from mechanical
- 2 vibrations, the energy harvester comprising:
 - 3 a first permanent magnet having a first pole and a second pole that
 - 4 generates a magnetic field;
 - 5 a second permanent magnet having a first pole in opposing flux
 - 6 relationship with the first permanent magnet first pole and a second pole;
 - 7 a flux concentrator attached to the first permanent magnet first pole and
 - 8 positioned between the first permanent magnet and the second permanent
 - 9 magnet;
 - 10 an induction coil surrounding the flux concentrator;
 - 11 a spring that mechanically couples the first and second permanent
 - 12 magnets to the induction coil in a manner that allows relative movement between
 - 13 the first and second permanent magnets and the induction coil in response to the
 - 14 external vibrations.

- 1 28. The inductive energy harvester of claim 27 wherein the flux concentrator is
- 2 comprised of a high magnetic permeability material.

- 1 29. The inductive energy harvester of claim 28 further comprising a flux yoke
- 2 extending from the first permanent magnet second pole to the second permanent
- 3 magnet second pole.

- 1 30. The inductive energy harvester of claim 28 wherein the flux yoke surrounds the
- 2 first and second permanent magnets.

- 1 31. The inductive energy harvester of claim 29 further comprising a non-magnetic
- 2 housing and wherein the spring attaches the housing to the flux yoke.

- 1 32. The inductive energy harvester of claim 31 further comprising a second spring
- 2 attached between the flux yoke and the housing.

- 1 33. The inductive energy harvester of claim 27 wherein the spring is a spiral disk
- 2 spring.

- 1 34. The inductive energy harvester of claim 27 wherein the spring is a leaf spring.

- 1 35. The inductive energy harvester of claim 27 wherein the spring is a coil spring.